



DTS-100D

SERIES

Safety, Operation, and Procedure Instructions for the DTS-100D AC Dielectric Oil Test Set

Danger- Lethal Voltages:

Equipment to be used by trained personnel only

This Operator Manual contains instructions for the operation of a High Voltage power source. The operator of this equipment must use good judgement and follow all safety precautions noted in this guide to ensure the protection of himself and others in close proximity to the test area. Failure to follow the instructions could result in injury or death. Proper grounding of the test set must be done prior to connecting this unit to a power source.

Operator Manual



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About the Operator Manual

Important

This Operator Manual describes the features and safe operation of a High Voltage Test Set. The instructions are intended to be clear and simple, but the operator must be trained and qualified according to established procedures for the use of this type of equipment.

This Operator Manual is organized to provide information on the **DTS-100D** in steps that familiarize the new operator with the operation of this test set.

Section 1: Specifications and Controls.

Section 2: Setup and Operation.

Section 3: Performing Special Operations.

The Functions, Features, and Specifications of the DTS-100D AC Dielectric Oil Test Sets is also discussed in the DTS Brochure available from High Voltage, Inc.

General Information

This section familiarizes the operator with the features and specifications of the

DTS-100D AC Dielectric Oil Test Set manufactured by **HIGH VOLTAGE, INC.**

Features and Specifications

The DTS-100D AC Dielectric Oil Test Set provides repeatable, accurate measurement of breakdown voltage of insulating oils used in electrical equipment.

Standard features of the DTS-100D Series of AC Dielectric Oil Test Set

- Three Fixed rates of rise, 500V/2000V/3000V per second
- Arc detection with 50 millisecond shutdown
- "Zero Start" and Access Interlock provision
- Primary connected 3.5 digit LED voltmeter display
- One piece portable design (cables and oil vessels store in the control case)
- Rugged aluminum case
- Window for observation of oil test
- Stop/Dwell rate of rise positions
- Simple controls

DTS-100D Portable Oil Dielectric Test Set

MODEL SPECIFICATIONS

	<p>DTS-100D</p> <p>Part No. DTS-0030S(120V)</p> <p>Part No. DTS-0046S(230V)</p>
Input	<p>120 V, 50/60 Hz, 7 amps, single phase</p> <p>230 V, 50/60 Hz, 3 amps, single phase</p>
Output	0-100kVac, 800VA resistive load, between outputs
Output Termination	Dual High Voltage Sections with 1.5 inch brass corona balls
Oil Test Cells Available	ASTM D1816
Operating Temperature	-10°C to 40°C
Distortion	<5%
Meter Accuracy	2% Full Scale
Kilovoltmeter	<p>3.5 digit LED</p> <p>Scaled 0-100.0 kVac (RMS)</p>
Case Size H.V. TANK	<p>18.5w x 17d x 16 high</p> <p>High Voltage Tank Included</p>
Weight	100 lbs. (45kg)

Table 1 DTS-100D Specifications.

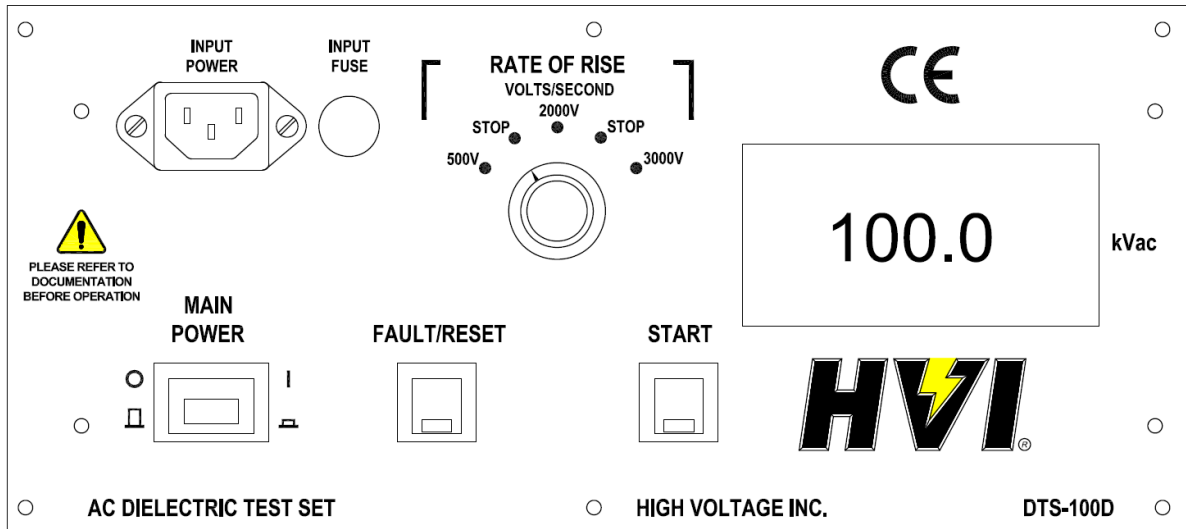


Diagram 1 DTS-100D Control Panel

INPUT POWER

The **INPUT POWER** connector accepts most standard electrical equipment type cords. The power supplied to the input connector must be from a **grounded** source rated to match the input power specifications noted in **Table 1**.

MAIN POWER

The **MAIN POWER** switch provides the power to the control and power circuits. The neon lamp will light when the power is on and voltage is available through the input line cord. The **INPUT FUSE** located electrically before the **MAIN POWER** switch provides line fault protection for the unit.

START

The **START** pushbutton activates the high voltage power circuits. The GREEN LED indicator lamp provides long life indication of the circuit status. The LED lights when high voltage is energized and the unit is ramping up in voltage.

RATE OF RISE

The **RATE OF RISE** output control sets the output voltage rise in three fixed rates, **500v/2000v/3000v per second**. The **STOP** positions between the rise voltages allow for manual override and calibration check of the output.

KILOVOLT METER

The digital **Kilovoltmeter** indicates the output voltage between the high voltage bushings in the test chamber. The calibration accuracy is 2% of full scale. At failure of the test sample, the meter will hold the breakdown voltage reading until the **Fault/Reset** pushbutton is depressed.

FAULT/RESET

The **FAULT/RESET** pushbutton resets the hold circuits after a breakdown of the test sample. This control can also be used to de-energize the high voltage power circuit. The RED LED indicator lamp provides long life indication of FAULT status. The LED lights when the output has de-activated from an arc in the test sample. When reset, the output control must ramp back to zero before the high voltage can be energized again.

ACCESS INTERLOCK(NOT ON CONTROL PANEL)

The **Access Interlock**. is provided for safety. It interlocks the access lid to the high voltage bushings and precludes the potential for shock by requiring the access door to be closed when high voltage is energized.

COMBINATION TC/VDE, IC/IEC OIL VESSEL

This Oil Vessel and motorized stirring assembly can be used with the DTS-100D at **500v/SEC** for testing in accord with ASTM Specification **D1816**. The vessel alone is used with the DTS-100D at **3000v/SEC** for testing in accord with ASTM Specification **D877**, or it can also be used with the DTS-100D at **2000v/SEC** for testing in accord with IEC Standard **IEC-156**.

The ASTM standards can be obtained from the American Society For Testing and Materials.

A note about the Oil Vessels made by High Voltage.

All the oil vessels designed and made by High Voltage Inc. have interchangeable posts and electrodes. These oil vessels were designed to conform to the ASTM test specifications requiring simple disassembly for cleaning. This design greatly reduces the time and effort required keeping your oil vessels in top operating condition.

SETTING UP THE EQUIPMENT

The setup of this equipment has been minimized by careful consideration of the operator during design. The DTS-100D one-piece construction permits convenient portability. *The DTS-100D test set requires that the unit be operated with the control panel in the horizontal position to keep oil over the high voltage transformer in the high voltage tank.*

1. **Select a location** for the unit that will allow easy viewing of the kilovolt meter.
2. **Be sure that all the controls are off**, in their de-energized or fully counterclockwise position.
3. **Remove all components** and oil vessels from the test chamber.
4. **Install the input line cord** into the **Input Power** receptacle.
5. **Connect the line cord to a suitable (120v or 230v, see Specification Table) grounded power source.**
6. **Select the desired Test cell.** Locate sufficient insulating liquid for the testing to be performed. If the shielded output cable option is being used refer to "Using the Shielded Output Cables" instruction section..
7. **Clean the Test Cell and Electrodes** thoroughly and adjust the spacing of the electrodes to conform with the proper ASTM Specification. Be sure the electrodes are securely tightened on the adjustment posts inside the oil vessel.
8. **Adjust the Voltmeter to zero** if required.
9. **Set the Rate of Rise** to the appropriate rate for the test being performed.

Operating the Equipment

There are standard tests specified (ASTM D877, ASTM D1816) for testing dielectric oils. This section provides step-by-step instruction on operation of the DTS-100D in conjunction with the necessity of following the aforementioned test specifications. Many facilities have their own in-house test standards structured around the ASTM specifications, and this manual is not to supercede these. The purpose of this section is to explain the capabilities of this test set in real-world applications.

1. Ensure that setup has been accomplished as noted in **Setting Up the Equipment**.
2. After checking the Test cell for proper electrode tightness, spacing and cleanliness, fill the selected oil vessel with sample oil to the level specified in the ASTM Standard. **The test sample oil temperature must be at or below 100C to avoid damage to oil vessel.**
3. Gently stir the oil test sample release trapped air on sides of test cup. Avoid creating any additional air into the test solution.
4. Place the filled test cell onto the bushing cradle toroids.
5. Allow the sample to stand for a minimum of three minutes. If the VDE cell used, plug the line cord from the stirring assembly into the receptacle in the test chamber.
6. Turn on **MAIN POWER**.

* * * CAUTION * * *

POTENTIALLY LETHAL VOLTAGES MAY BE PRESENT

7. Depress the START pushbutton to start the test. Observe the test cell as the output ramps up at the preset rate. The voltage will rise until the sample breaks down. At breakdown, the unit will turn off, light the **Failure** LED and hold the breakdown voltage reading.
8. After recording the breakdown voltage, depress the **Reset/Failure** pushbutton. Allow the output control to return to zero.

9. Perform further tests in accord with instructions as outlined in the appropriate ASTM test specification.

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PERFORMING SPECIAL OPERATIONS

The following section contains information on the care and upkeep of your new DTS SERIES AC Dielectric Oil Test Set . There are some notes on troubleshooting and service, which will save much time and money over the life of the unit.

Meter Re-calibration

The DTS-100D Dielectric Oil Test Set uses precision metal film resistors for measurement and calibration of the voltmeter. The use of these resistors has minimized circuit drift due to aging and temperature. But, a potentiometer (R16) on the voltmeter PCB can be used to correct for any drift from the aging of the meter.

The certification of meters on a yearly basis is recommended to ensure accurate test results.

Voltmeter Re-calibration

1. Locate the unit in a position that will allow easy reading of the meters. Remove the input line cord from the input connector.
2. Remove the edge panel screws lift the entire control chassis assembly to gain access to the calibration pot on the back of the voltmeter. Place the control chassis diagonally over the opening.
3. Zero the meter movement using the zero adjustment below the scale window.
4. Perform the steps in **Setting up the Equipment** at the start of **SECTION 2**.
5. Connect one output ball to a calibrated reference meter with ability to read to the full output voltage of the unit. Be sure to ground the low side of the meter. **(Calibration should be performed with the cup support brackets removed to avoid unnecessary arcing).**
6. Replace the input line cord and energize input power.

7. Using the **RATE OF RISE** control to stop the voltage rise, raise the output to 50kV on the unit meter. Adjust R16 as required.(NOTE: You will be reading 1/2 the output from Bushing to ground. Check both bushings separately and add the readings together to achieve actual calibration voltage reading.)
8. Check calibration at full scale and on the high range at both half and full scale. If the customer facility calibration certification requires more points of reference, follow those procedures instead of these. DO NOT EXCEED THE RATING OF ANY CALIBRATION DEVICE WHEN PERFORMING THESE STEPS. Calibration may need to be accomplished at lower voltages to avoid dangerous conditions such as applying over-voltage on the divider probe.

RETURNED MATERIAL

If for any reason it becomes necessary to return any equipment or materials to High Voltage, Inc., the Service Department of High Voltage, Inc. must be notified, and authorization received, prior to the shipment of the equipment. When notified, the following information must be provided:

MODEL:

SERIAL NO:

PART NO:

REASON FOR RETURN:

SUSPECTED DEFECT:

CAUSE OF DEFECT:

With the above information provided, High Voltage, Inc. will determine if the return of the equipment is appropriate. If deemed appropriate, a Return Authorization Number will be issued. At that time, the Purchaser will be instructed how to mark and return the equipment.

The above procedure must be adhered to in order to ensure prompt service. No equipment should be returned without the prior knowledge and authorization of High Voltage, Inc.

REPLACEMENT PARTS ORDERING

To order replacement parts, first refer to the Parts List for the product in question. Every part is issued a part number. It will be necessary for this part number and the product model and serial number to be provided. When calling High Voltage, Inc. request the Service Department.

THESE TERMS AND CONDITIONS OF SALE AND LIMITED WARRANTY OF HIGH VOLTAGE, INC. ("High Voltage") SHALL BE GOVERNED BY AND CONSTRUED ACCORDING TO THE INTERNAL LAWS OF THE STATE OF NEW YORK, USA, WITHOUT GIVING EFFECT TO ITS CONFLICT OF LAWS PROVISIONS. THE RIGHTS AND OBLIGATIONS OF ALL PARTIES AND ALL PERSONS OR ENTITIES CLAIMING HEREUNDER SHALL NOT BE GOVERNED BY THE PROVISIONS OF THE 1980 U.N. CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS.

1. **ACCEPTANCE.** All orders become effective only when accepted by High Voltage's written order acknowledgment at Copake, New York, USA. Unless modified in writing by an authorized representative of High Voltage, or modified in High Voltage's Quotation or order Acknowledgment, these Terms and Conditions and Limited Warranty shall solely control Purchaser's order. High Voltage expressly rejects any additional or different provisions, terms or conditions proposed by Purchaser at any time.

2. **SCHEDULING.** High Voltage's shipping date specified in High Voltage's quotation or purchase order acknowledgment is approximate and High Voltage shall use reasonable commercial efforts to effect timely shipment. Furthermore, High Voltage shall not be liable for any delay in the performance of orders or contracts or in the delivery or shipment of goods or for any damages suffered by Purchaser by reason of such delay when such delay is, directly or indirectly, caused by, or in any manner arising from Purchaser's fault, fires, floods, accidents, riots, acts of God, war, governmental interference or, embargoes, strikes, labor difficulties, shortage of labor, fuel, power, materials or supplies, transportation delays, or any other cause or causes (whether or not similar in nature to any of these hereinbefore specified) beyond the control of High Voltage.

3. **CANCELLATIONS.** Prior to shipment, Purchaser may request cancellation or delayed delivery of an order or part thereof, but such shall be conditioned upon written consent of High Voltage and upon payment to High Voltage of cancellation or delayed delivery charges to be determined by High Voltage.

4. **SALE AND DELIVERY.** Unless otherwise agreed in writing, sale and delivery of the goods hereunder shall be made EXW or FCA (Incoterms® 2010) at High Voltage's option, High Voltage's dock at Copake, New York, USA, at which time all risk of loss or damage shall pass to Purchaser. All shipments and packaging shall be made in the manner determined by High Voltage, unless otherwise requested by Purchaser, in which case any resultant additional changes and expenses shall be paid by Purchaser.

5. **TAXES.** Any and all sales, use, excise and similar taxes, and duty and all other charges levied or imposed by governmental authority, foreign and domestic, upon any goods sold or contracted to be sold shall be paid by Purchaser and added to the purchase price unless appropriate tax exemption certificates are supplied to High Voltage in form satisfactory to High Voltage.

6. **PAYMENTS.**

a. All payments shall be in US Dollars without discount unless otherwise specified in High Voltage's order acknowledgment. Credit card payments are accepted only if specified in High Voltage's order acknowledgment.

b. Terms of payment are net thirty (30) days from date of invoice, unless otherwise agreed by High Voltage in its order acknowledgment. Delinquent payments are subject to a service charge on the unpaid balance from invoice date equal to the lower of 1-1/2% per month or the maximum rate permitted by law until all amounts are paid in full. If the financial responsibility of Purchaser becomes unsatisfactory to High Voltage for any reason, or if Purchaser has been in default to High Voltage under any order, High Voltage may require full payment in cash before shipment of goods.

c. If Purchaser so requests and makes arrangements prior to shipment

which meet High Voltage's full satisfaction, High Voltage in its discretion may accept irrevocable letters of credit in its favor issued by a United States bank which is satisfactory to High Voltage.

7. **INFRINGEMENT, ETC.** On goods manufactured to Purchaser's specifications, Purchaser shall and does indemnify and hold High Voltage harmless against any claims, damages, liabilities, costs and expenses (including attorneys' fees) arising out of or resulting from actual or alleged infringement of patent, copyright, trademark or other proprietary rights, or claim of unfair trade or unfair competition arising from or occasioned by the use, possession, sale or delivery of any such goods sold by High Voltage.

8. **REPRODUCTION RIGHTS.** Drawings, specifications, reports, photographs and other data relating to all orders and all proprietary rights and interests therein and the subject matter thereof shall be and remain the property of High Voltage. Purchaser agrees that it shall not use High Voltage's drawings, specifications or other materials covered by this order, or any similar article from any other source, or reproduce the same or otherwise appropriate them, without the prior written authorization of High Voltage.

9. **LIMITED WARRANTY.**

a. High Voltage warrants to the original Purchaser of any new goods that the goods are free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment by High Voltage. The obligation of High Voltage under this Limited Warranty is limited, in High Voltage's exclusive option, to repair, replace with new or reconditioned parts or issue credit for goods, parts or materials which prove to be defective. Costs incurred by Purchaser for labor or other expenses to repair or replace such goods, parts and/or materials shall be the sole responsibility of Purchaser. High Voltage shall not be responsible for any damage or lack of performance resulting from: (i) defects due to accident, negligence, alteration, modification, faulty installation, abuse or misuse, whether by Purchaser, Purchaser's agents or employees, or by others than High Voltage (ii) attempted or actual dismantling, disassembly, service or repair by any person, firm or corporation not specifically authorized in writing by High Voltage, or (iii) defects caused by or due to handling by carrier, or incurred during shipment, transshipment or other move.

b. High Voltage expressly disclaims any warranty whatsoever of (i) consumables, and of (ii) parts, components, software (including but not limited to object code and source code and software user instructions), accessories, and materials not prepared, compiled or manufactured by High Voltage, and Purchaser must deal directly with such other supplier. High Voltage may elect to assist Purchaser in settling such claim against such other supplier, but any such assistance shall not prejudice High Voltage's position as to its own liability.

c. Compliance with the following Limited Warranty Claim Procedure is a condition precedent to the obligation of High Voltage under this Limited Warranty:

i. Purchaser must notify High Voltage in writing as soon as is reasonably possible, but within the applicable warranty period, of any alleged defect in material, workmanship, or operation of any goods covered under this Limited Warranty. Such notice must describe in detail the defect, any and all defective parts, and the alleged cause of the defect. No goods may be returned to High Voltage without High Voltage's prior written permission, which permission may be withheld by High Voltage in its sole discretion.

ii. At the exclusive option of High Voltage, Purchaser may be directed in writing to dismantle the goods at the Purchaser's cost and expense and ship the goods prepaid to High Voltage (refer to "Returns" Section 10 for provisions regarding the return of any goods to High Voltage). If High Voltage elects to inspect the goods at Purchaser's site, and to repair, replace,

[Section 9.c.ii. continued on page 2]

or ship the defective goods to High Voltage's factory, Purchaser, at its own cost and expense, shall provide the facilities for such work as needed to inspect and evaluate and possibly repair/replace the goods. If inspection discloses that the defect is not one for which High Voltage is liable, then Purchaser shall promptly reimburse High Voltage for all expenses incurred.

iii. Upon receipt of the defective goods, or following access to the same, High Voltage shall inspect and evaluate the goods and determine the validity of Purchaser's claim.

iv. The validity of any warranty claim, Purchaser's compliance with the Limited Warranty and Limited Warranty Claim Procedure, and the obligation to replace, repair, or issue credit for any goods are solely and exclusively to be determined by High Voltage and any determination shall be final and binding.

d. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, STATUTORY OR EXPRESSED OR IMPLIED ON THE PART OF HIGH VOLTAGE, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT; FURTHERMORE, HIGH VOLTAGE MAKES NO WARRANTY REGARDING NON-INTERRUPTION OF USE OR SOFTWARE FREEDOM FROM BUGS. HIGH VOLTAGE NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON, FIRM, OR CORPORATION TO ASSUME ANY LIABILITY OR OBLIGATION IN CONNECTION WITH THIS SALE OR LIMITED WARRANTY ON HIGH VOLTAGE'S BEHALF AND PURCHASER ACKNOWLEDGES THAT NO REPRESENTATION EXCEPT THOSE MADE HEREIN HAS BEEN MADE TO PURCHASER.

10. **RETURNS.** No goods may be returned to High Voltage without High Voltage's prior written permission, which permission may be withheld by High Voltage in its sole discretion. Any request for return authorization must be in writing and include, as applicable, model number, serial number, part number, reason for return, alleged defect, and apparent cause of alleged defect. Except as specifically provided in Section 9 Limited Warranty, if High Voltage consents to return of goods: (a) all return shipments are to be via prepaid freight and with all other charges prepaid, (b) if goods are returned to High Voltage within sixty (60) days from the date of original shipment for reasons other than an error by High Voltage in filling the Purchaser's order, Purchaser shall only be entitled to receive a credit in an amount equal to the payment received by High Voltage for the goods minus (i) handling charges, and (ii) a restocking fee determined solely by High Voltage which shall not exceed twenty five percent (25%) of the invoiced amount, and (c) if goods are returned to High Voltage after sixty (60) days from the date of original shipment for reasons other than an error by High Voltage in filling the Purchaser's order, Purchaser shall only be entitled to receive a credit in the amount equal to the payment received by High Voltage for the goods minus (x) a handling fee, and (y) a restocking fee in excess of twenty five percent (25%) which shall be determined by High Voltage.

11. **SECURITY INTEREST.** In order to induce High Voltage to ship goods without full payment, Purchaser grants a security interest to High Voltage in any and all of Purchaser's right, title and interest in the goods, and Purchaser agrees to comply with any reasonable request of High Voltage to perfect such security interest. Purchaser hereby further authorizes High Voltage to perfect High Voltage's security interest in said goods and consents to filing one or more financing statements without the signature of Purchaser.

12. **ARBITRATION.** Any controversy arising out of or relating to this document, or any breach thereof, including, without limitation, any claim that this document is voidable or void, shall be submitted to final and binding arbitration before, and in accordance with, the Commercial Rules of the American Arbitration Association then in effect, and judgment upon the award may be entered in any court have jurisdiction thereof; provided, however, that this clause shall not be construed to limit any rights which

High Voltage may have to apply to any court of competent jurisdiction for equitable, injunctive or provisional relief. This arbitration provision shall be deemed self-executing, and in the event that either party fails to appear at any properly noticed arbitration proceeding, an award may be entered against such party notwithstanding said failure to appear. Such arbitration shall be conducted before a single arbitrator under the aegis of the American Arbitration Association in Columbia County, State of New York. The arbitrator shall have the authority to award expenses to the successful party.

13. **LIMITATION OF LIABILITY.** TO THE MAXIMUM EXTENT PERMITTED UNDER APPLICABLE LAW, AND NOTWITHSTANDING ANYTHING ELSE IN THIS DOCUMENT OR OTHERWISE, INCLUDING THAT HIGH VOLTAGE WAS WARNED THAT DAMAGES WOULD OCCUR OR WERE LIKELY TO OCCUR, HIGH VOLTAGE SHALL NOT BE LIABLE WITH RESPECT TO ANY SUBJECT MATTER OF THIS DOCUMENT UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR (i) ANY AMOUNTS IN EXCESS IN THE AMOUNT PAID TO HIGH VOLTAGE FOR THE PARTICULAR GOODS OR PART THEREOF WHICH GAVE RISE TO THE APPLICABLE CAUSE OF ACTION OR CLAIM, OR (ii) ANY INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST OR CORRUPTED DATA, OR (iii) COST OF PROCUREMENT OF SUBSTITUTE GOODS, SOFTWARE, TECHNOLOGY OR SERVICES. HIGH VOLTAGE SHALL HAVE NO LIABILITY FOR ANY FAILURE OR DELAY DUE TO MATTERS BEYOND ITS REASONABLE CONTROL.

14. **SEVERABILITY.** These Terms and Conditions and Limited Warranty are the entire understanding between Purchaser and High Voltage with respect to the subject matter hereof and supersede all prior agreements, dealings and negotiations. No modification, alteration or amendment shall be effective unless made in writing and signed by a duly authorized representative of High Voltage. No waiver of any breach hereof shall be held to be a waiver of any other or subsequent breach. Nothing contained in this document shall be construed as requiring the commission of any act contrary to law. Whenever there is any conflict between any provision of this document and any present or future statute, ordinance or regulation contrary to which the parties have no legal right to contract, the latter shall prevail, but in such event the provision of this document thus affected shall be curtailed and limited only to the extent necessary to bring it within the requirements of the law. In the event that any part, article, section, paragraph, sentence or clause of this document shall be held to be indefinite, invalid or otherwise unenforceable, the entire document shall not fail on account thereof, and the balance of the document shall continue in full force and effect. If any arbitration tribunal or court of competent jurisdiction deems any provision hereof (other than for the payment of money) unreasonable, said arbitration tribunal or court may declare a reasonable modification thereof, and this document shall be valid and enforceable, and the parties hereto agree to be bound by and perform the same as thus modified.

15. **BASIS OF BARGAIN.** Each party recognizes and agrees that the warranty disclaimers and liability and remedy limitations in this document are material, bargained for bases of their agreement and that they have been taken into account and reflected in determining the respective obligations of the parties.

[End]

